Ciel et Terre. Bruxelles. 20me Année.

Ventosa, V. La direction du vent et la scintillation. [Concluded.] P. 328.

Ridder, J. P. de. L'abeille et la pluie. P. 337.

Arctowski, H. Résultats préliminaires des observations météorologiques faites pendant l'hivernage de la *Belgica*. III Roses des vents: Phénomènes atmosphériques. P. 353.

——— Circulation de l'air dans les cyclones et les anticyclones. P. 370.

L'Aerophile. Paris. 7me année.

Besancon, G. Résultats obtenus á l'aide des ballons-sondes de MM. Hermite et Besançon. P. 99.

Proceedings of the Royal Society. London. Vol. 65.

Wilson, C. T. R. Comparative Efficiency, as Condensation nuclei, of positively and negatively charged Ions. P. 289.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made partly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological observations at Honolulu, September, 1899.

The station is at 21° 18′ N., 157° 50′ W.
Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.
The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force or amounts of cloudiness, connected by a dash, indicate change from one to the other.
The rainfall for twenty-four hours has always been measured at 7:30 p. m., not 1 p. m., Greenwich time, on the respective dates.
The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2:30 a. m., Honolulu time.									Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.98	74	67	84	76	63.3	60	ne.	2-4	5	30.06	29.96	0.03
2	29.95	74	66.5	82	72	63.3	64	ne.	2-4-0	6-2	30.01	29.92	0.05
3	30.00	75	67	84	71	62.7	61	ne.	2	3	30.02	29.92	0.00
4	30.03	74	67	84	74	63.0	60	ne.	3	2	30.05	29.98	0.00
5	29.98	73	67.5	85	74	62.7	61	ne.	3	2	30.06	29.95	0.06
6	29.98	72	68	84	71	64.5	65	ne.	4	5	30.02	29.94	0.04
7	30.04	75	69	84	72	64.7	67	ne.	4	4	30.06	29.98	0.08
8	30.04	75	69	84	72	65.5	65	ne.	4	1	30.08	30.00	0.00
9	29.97	76	69	85	74	65.0	65	nne.	3	2-5	30.06	29.97	0.00
01	29.90	75	68	83	75	63.7	62	nne.	3	4-8	29.97	29.88	0.02
11	29.92	74	68.5	81	75	65.0	68	nne.	3	7-4	29.96	29.89	0.08
12	29.90	77	71.5	83	73	68.5	75	ne.	1	8	29.96	29.90	0.03
13	29.89	75	67.5	84	76	68.5	72	ne.	3	8	29.96	29.89	0.00
14	29.85	70	67.5	84	75	65.0	63	ene.	4-0	4-0-4	29.93	29.84	0.01
15	29.87	72	67	85	69	65.7	69	se-ne.	2	5	29.91	29.81	0.00
16	29.93	75	67.5	84	72	63.3	63	nne.	3-4	3	29.97	29.86	0.00
17	29.94	74	68	85	74	62.5	59	ne.	3	2	29.98	29.91	0.01
18	29.94	74	66.5	84	73	63.5	63	ne.	3	3	29.98	29.91	0.03
19	29.94	75	67.5	82	71	62.3	60	nne.	3	5	30.00	29.90	0.01
20	29.99	75	67.5	83	73	63.3	61	nne.	3	6	30.02	29.94	0.01
21	29.98	72	68.5	83	74	64.5	66	nne.	3	6	30.05	29.97	0.04
22	29.98	75	69	81	72	67.3	77	ne.	2-5	6	30.03	29.95	0.14
23	29.95	74	68	83	73	66.7	70	ne.	4	3	29.99	29.93	0.06
24	30.00	75	68.5	84	71	65.0	64	ne.	2	2-4	30.05	29.95	0.00
25	30.05	75	68	83	75	65.3	65	ne.	2	7	30.07	29.99	0.00
26	29.98	72	68	84	75	63.7	63	ne.	2-4	9	30.09	29.96	0.08
27	29.93	73	67.5	81	71	67.5	74	ne.	2	7-3	29.99	29.91	0.01
28	29.94	73	67	84	72	64.3	64	ne.	2	3	29.99	29.90	0.00
29	30.02	75	67.5	84	73	63.3	62	ene.	2	2	30.06	29.94	0.00
30	30.08	70	68.7	84	75	63.7	62	ene.	4	4	30.09	29.97	0.06
Sums	......	......	......	......	......	......	......	......	......	......	......	......	......
Means	29.96	73.9	67.9	83.5	73.1	64.6	65.0	......	2.9	4.5	30.015	29.927	0.80
Departure	0.00	......	......	......	......	—2.0	—2.0	......	......	+0.5	......	......	—1.35

Mean temperature for September, 1899 (6+2+9), ÷3=77.1°; normal is 77.8°.
Mean pressure for September (9+3) ÷ 2 is 29.967; normal is 29.969.
* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:30 p. m., Greenwich time. ‡ These values are the means of (6+9+2+9) ÷ 4. § Beaufort scale.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Senor Manuel E. Pastrana, Director of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for August, 1899.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	Inch.	°F.	°F.	°F.	%	Inch.		
Colima	......	......	89.6	69.8	......	......	......	......	......
Culiacán Rosales (E. d. S.)	112	29.69	98.6	73.4	85.8	73	4.35	ne.	......
Durango (Seminario)	6,243	24.05	91.4	56.1	72.1	55	0.79	sw.	e.
Guanajuato	6,761	23.70	82.6	55.0	66.7	62	4.98	ne.	ne.
Leon (Guanajuato)	5,934	24.30	84.4	50.4	68.4	64	2.93	se.	ne.
Mexico (Obs. Cent.)	7,472	23.06	77.9	50.0	61.9	69	5.13	nw.	ne.
Morelia (Seminario)	6,640	23.98	76.5	54.9	63.5	80	5.90	e.	e.
Puebla (Col. Cat.)	7,112	23.36	77.0	49.8	66.7	77	5.85	e.	se.
Saltillo (Col. S. Juan)	5,399	24.78	87.8	63.0	75.2	57	0.78	nnw.	ne.
San Isidro (Hac. de Guanajuato)	......	......	78.4	67.1	......	......	4.72	se.	......
Silao	6,063	24.28	79.7	58.8	70.3	64	4.46	ene.	ese.

Mexican data for September, 1899.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	Inch.	°F.	°F.	°F.	%	Inch.		
Colima	1,600	28.27	93.9	63.3	77.7	76	9.54	sw.	ssw.
Culiacan Rosales (E. d. S.)	112	29.71	100.8	74.7	86.5	67	2.50	ne.	......
Leon (Guanajuato)	5,934	24.35	81.3	46.2	65.5	67	4.53	s.	e.
Mexico (Obs. Cent.)	7,472	23.10	74.1	44.6	60.1	70	6.68	n.	ne.
Morelia (Seminario)	6,401	23.98	75.2	48.9	61.7	78	6.67	se.	e.
Oaxaco	5,164	25.08	91.8	50.0	67.1	82	5.69	nw.	ne.
Puebla (Col. Cat.)	7,112	23.38	75.2	44.4	64.9	81	6.01	n.	ne.
Saltillo (Col. S. Juan)	5,399	24.86	80.6	50.0	66.7	69	4.26	n.	sw.
San Isidro (Hac. de Guanajuato)	......	......	75.2	64.4	......	......	7.72	......	......
Silao	6,063	24.32	76.8	54.5	68.0	62	4.65	ene.	ese.
Zapotlan (Seminario)	5,078	25.12	81.0	52.0	67.8	67	7.53	n.	se.

THE ORIGIN, PATHS, AND LIMITING ZONES OF THE TYPHOONS OF THE ORIENT.

(An address by Paul Bergholz, Director of the Meteorological Observatory at Bremen. Read before the Section of Physics and Meteorology at the seventy-first meeting of German scientists, Munich, September 19, 1899. Translated by the Editor.)

In 1897 a work was published[1] in which there is brought together and skilfully combined into a whole all the extensive material relative to the hurricanes of the Tropics that had, up to that time, been collected by the observatories at Hongkong, Tokio, Manila, and Shanghai. Especially numerous are the observations collected in Manila, because there is scarcely a single large atmospheric disturbance that develops in the waters of the Orient that does not make itself felt in the Philippines. Scattered through the book, as was appropriate since it had a purely practical object, are some general considerations relative to the origin, the paths, and the zones of hurricanes. We will at present examine these views more closely but, of course, can not reproduce the extensive tabular material.[2]

[1] Baguios ó Ciclones Filipinos. Estudio Téorico-Practicó por el P. José Algué, S. J., Director del Observatorio. Manila, 1897.

[2] Compare Bergholz, "Die Orkane des Fernen Ostens." Max Nössler, Bremen und Shanghai, 1899.

According to Viñes the cyclone regions of the Tropics harmonize in a more or less perfect manner with the following geographical sketch:

In the West they occur on the open sea and on continents or islands that are rich in indentations and bays, whose coasts trend in general north and south; in the East they occur over broad extensive oceans that are strewn with islands.

These conditions are more or less perfectly fulfilled in the cyclone regions of Central America, the Philippines and the China Sea, the Indian Ocean, and, in the Southern Hemisphere, the cyclone regions of southern Africa, with the neighboring islands of Madagascar, Mauritius, Rodriguez, etc. These regions do not offer equally favorable conditions for the formation of cyclones in every season of the year.

In order to trace the hurricanes of eastern Asia back to their initial conditions, observations must be obtained from the Caroline Islands, the Marianna Islands, and the portions of the ocean lying east of Mindanao, but such observations were first made in sufficient numbers in recent years.

If we group the paths of the better known hurricanes since 1878, according to months, we recognize not only the tropical origin, but also that the hurricanes of individual monthly groups have much similarity in their paths and their initial conditions. We can, indeed, not draw very sharp division lines, because the hurricanes of neighboring months, for instance, September and October, must be almost identical in their paths and their origins. If, however, we keep this in mind in the respective cases, we may divide the hurricanes into three groups of months, the first of which extends from December to March, inclusive, the second includes April and May, October and November; the third includes the remaining months of the year, viz, June, July, August, and September. The place of origin of by far the largest number of all tropical cyclones lies east of the Philippines; many are formed south of latitude 10° N., but none are formed north of 20° N.

In the first group, the larger number of the hurricanes originate in latitudes lower than 10° N., and only in the beginning of December and the beginning of March are they formed somewhat farther to the north: therefore, for this group the starting points are located between latitudes 5° N. and 12° N., and longitudes 145 E. and 143° E.

In the second group, the region of formation of cyclones extends from 147° E. to 129° E.

In the third group, the limits of this region are 20° N. and 8° N., and 139° and 126° E.

If we consult the charts of isobars and isotherms that are given in the Boletin Mensual of the Manila Observatory for 1894, we find that in the first group the starting points of the hurricanes lie between the isobars 757 and 759 mm., and between the isotherms 27° and 30° C. For the second group the origins lie between the same isobars and the isotherms 28° and 30°. In September the origins lie on the isobar 757 mm., but in the remaining months of the third group, between 757 and 759 mm. In all the months of this group they lie between the isotherms 28° and 29° C.

It follows that hurricanes are formed in regions within which neither the barometric nor the thermometric gradient has any notable value, and therefore in a sort of neutral zone.

From February to July and August the origins move toward the north-northwest, and then, until January, backward toward the south-southeast. These movements show a connection between the declination of the sun and the origin of a cyclone.

The paths of the tropical hurricanes of eastern Asia can be classified into two great divisions, those of the Pacific Ocean and those of the China Sea. The former do not intersect the meridian 130° E., but the hurricanes of the China Sea do intersect this meridian, or even sometimes are formed in the China Sea itself.

TYPHOONS OF THE PACIFIC OCEAN.

The following table shows at a glance our classification of the hurricanes of the Pacific Ocean:

Typhoons of the Pacific Ocean.

Group.	Months.	Trend of first branch.*	Latitude of vertex of parabola.	Trend of second branch.
1	December, January, February, March	North-northwest	15°-19°	North-northeast.
2	April-May, May, October, November	Northwest	16°-21°	Northeast.
3	June, July, August, September	Northwest by north.	21°-25°	Northeast by east.

* Namely, when passing the small circle of latitude for Manila.

In general, the paths of these hurricanes are all parabolic. The average trend of the paths or the inclination to the meridian is much larger when they pass the latitude of Manila (14° 35′ N.) than the average trend in the first branch. This is particularly noticeable during the months of the first group, and this evidently results from the fact that the latitude of the intersection [vertex?] of the path agrees very nearly with the latitude of Manila.

TYPHOONS OF THE CHINA SEA.

Not a single one of the hurricanes that occur in the months belonging to the first group turn backward or have a parabolic path. However, it is possible that occasionally these cyclones recurve in the interior of the Continent of Asia, but observations on this point are still wanting.

Some of the hurricanes of the second group have a parabolic path. These turn back in the China Sea south of the Formosa Channel. Since, however, the first branch of such a path inclines northward less than is the case with the hurricanes of the Pacific Ocean, therefore its recurvature is completed in lower latitudes than by those hurricanes.

The hurricanes that belong to the typhoon months, properly so called, or to the third group, recurve much more frequently than the others. They also attain much higher latitudes. The recurving hurricanes of this third group are very similar in their properties to the hurricanes of the Pacific Ocean proper. If we follow the course of the paths of those hurricanes of the China Sea that do not recurve, there results:

1. The hurricanes that are formed in the months of December to March have, from the beginning, a motion in the direction west by north, which they retain through their whole course over the southern portion of the China Sea. In December and January they reach the Asiatic Continent in French Cochin China and the southern coast of Anam; those of February and March arrive somewhat farther to the north, almost exclusively in Anam. The origin of these hurricanes is between latitudes 5° and 12° N., but they arrive on these coasts between 8° and 15° N. This defines the zone of these hurricanes.

2. The hurricanes of April and May pursue a direction toward the northwest by west; in April they arrive in northern Anam, in May in the Gulf of Tonquin (Tong-King) and the Straits of Hainan, but at the end of May they reach the region of Macao (22° N.). The October cyclones, which pursue a west-northwest course, reach the Continent of Asia in the

first part of the month, as far north as Hongkong (22° N.), but later in the month they arrive farther south, namely, in the Gulf of Tonquin. In November the trend of the hurricane has again become west by north and again they strike the coast of Anam. The origin of this group of hurricanes lies between latitude 6° and 17° N., and they strike the coast between latitude 12° and 23°.

3. The June hurricanes of the third group, having a northwesterly movement, pass between "Breaker Point" (N. 23°, E. 117°) and the Straits of Hainan (N. 20.2°, E. 110.5°), on the south coast of China. Some of them curve backward in the southern portion of Formosa Straits.

4. The July typhoons which, at the beginning, also take a northwest course, can be divided into three classes. Those of the first class move like those of June; those of the second class arrive on the Chinese coast between Amoy (24° N.) and Shanghai (31.3° N.) or curve backward and pass over the Yellow Sea in a north-northeast direction; those of the third class finally recurve opposite Formosa (23.5° N.) and pass over the Sea of Japan.

5. In August the original movements of the cyclones still remain toward the northwest, and in other respects they behave the same as those of July. The September hurricanes move at first toward northwest by west., but in other respects behave like the first and third classes of the July hurricanes.

6. For the hurricanes of the months of the third group (June–September) the zone extends from their place of origin, between latitudes 8° and 20°, to their place of arrival on the Continent of Asia, between the parallels 30° N. and 18° N.

If now, with the assistance of the charts of isobars, we determine the conditions under which the cyclones are formed in the different months and groups of months, we find:

(*a*) The paths of the hurricanes of the Pacific Ocean in the first group start from the region between two areas of high pressure, one of which lies over the continent, the other over the Pacific Ocean. They lead toward the center of low pressure that occupies a portion of Bering Sea. The hurricanes of the China Sea keep within lower latitudes, namely, those which are reached by the limiting isobars of the Asiatic center of high pressure. In proportion as the centers of high pressure flatten out and withdraw during the period from January to March, so these extreme isobars retreat toward the north, and consequently the paths of the hurricanes extend farther north.

(*b*) With reference to the second group, the charts of monthly isobars show that the hurricanes of the Pacific Ocean in April and May move between the extreme isobars of the high pressure areas of the Pacific Ocean and Asia.

(*c*) The paths of the hurricanes of the China Sea keep south of the isobar 760 mm., belonging to the high pressure area of Asia and the low pressure area of Hindostan. In October and November, in proportion as the Asiatic high pressure area develops, these are pushed more and more into lower latitudes; moreover, the development of the area of low pressure in Hindostan is an index to these paths.

(*d*) The hurricanes of the Pacific Ocean, especially in October, pass along the broad zone between the Philippines and Japan, on the one hand, and the isobar of 760 mm. surrounding the high pressure area of the Pacific. In November this zone becomes narrower by reason of the further development of the continental area of high pressure. The hurricanes of the Pacific Ocean belonging to this group also pursue paths toward the depression in the extreme north, which bears north-northeast from Manila.

(*e*) It is characteristic for the months of the third group that from June to September, at least to the middle of the latter month, the center of high pressure withdraws from the coast of Asia, and finally disappears. In connection with this the paths of the hurricanes attain higher latitudes, and those of the Pacific Ocean recurve very near the meridian of 125° east, therefore nearer to the Philippines than in the previous months. A single exception offers in the case of the hurricanes of the second half of September, whose recurving points are from 5° to 8° farther east. All hurricanes in the Pacific Ocean have as their ultimate destination the northern center of low pressure. The paths of the hurricanes of the China Sea trend more toward the north in proportion as the high pressure area of the continent moves northward, and do this, therefore, up to the end of August and the beginning of September; if, however, the low pressure area moves toward the south about the beginning of September, then also the paths of these cyclones must follow it. Some of the July hurricanes after recurving follow paths going very nearly northward; they cross over the Yellow Sea and travel toward a small center of low pressure that has developed in Siberia.

THE INTERNATIONAL CLOUD WORK OF THE WEATHER BUREAU.[1]

By FRANK H. BIGELOW, Professor of Meteorology, U. S. Weather Bureau.

In the month of May, 1896, several national meteorological services began in cooperation to take a series of simultaneous observations on the height and the motion of the ten standard types of clouds which have been defined by the International Committee. The object of this survey of the movements of the atmosphere, continued for at least one year, was to gather material that could be used to determine the action of the higher strata with reference to the formation and the progressive motion of storms. Our observations are generally so exclusively made in the lowest level of the ocean of air that comparatively imperfect information exists regarding the higher currents upon which to found intelligent theories, and it is with the purpose of supplying this deficiency that the series of international observations was undertaken. By the liberal policy of the United States Government, the Weather Bureau was able to do its part of the work. The discussion of the data is now finished for the report which it is expected to issue by the end of the present year. While it is not practicable to give any detailed account of the results, it may be interesting to present a brief synopsis of the scope of the report now being prepared by the writer.

The observations are divided into two classes: (1) The primary, which are made by means of two theodolites placed at the end of a long base line adapted to triangulations in the vertical direction. These give the absolute height, velocity, and direction of motion of individual clouds; between 6,000 and 7,000 of such observations were made at Washington, D. C. (2) The secondary, executed with nephoscopes at 14 stations distributed at nearly equal distances from each other over the districts east of the Rocky Mountains, give the relative velocity and direction of motion, and with the help of the results obtained by the primary system can be translated into absolute values; there were 25,000 to 30,000 of these observations made in the United States.

The discussion of these data has been divided into a number of parts, of which the following may be mentioned in this connection:

1. The distribution of the cirrus, cirro-stratus, cirro-cumulus, alto-cumulus, alto-stratus, strato-cumulus, cumulo-nim-

[1] The important work on which Professor Bigelow has been engaged for several years is now completed and about to be published in the Annual Report for 1898–99. Meantime, our readers will be glad to obtain a comprehensive statement as to the nature of the work; we therefore reprint the accompanying article from the National Geographic Magazine for September, 1899.